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FOREST HYDROLOGY LABORATORY

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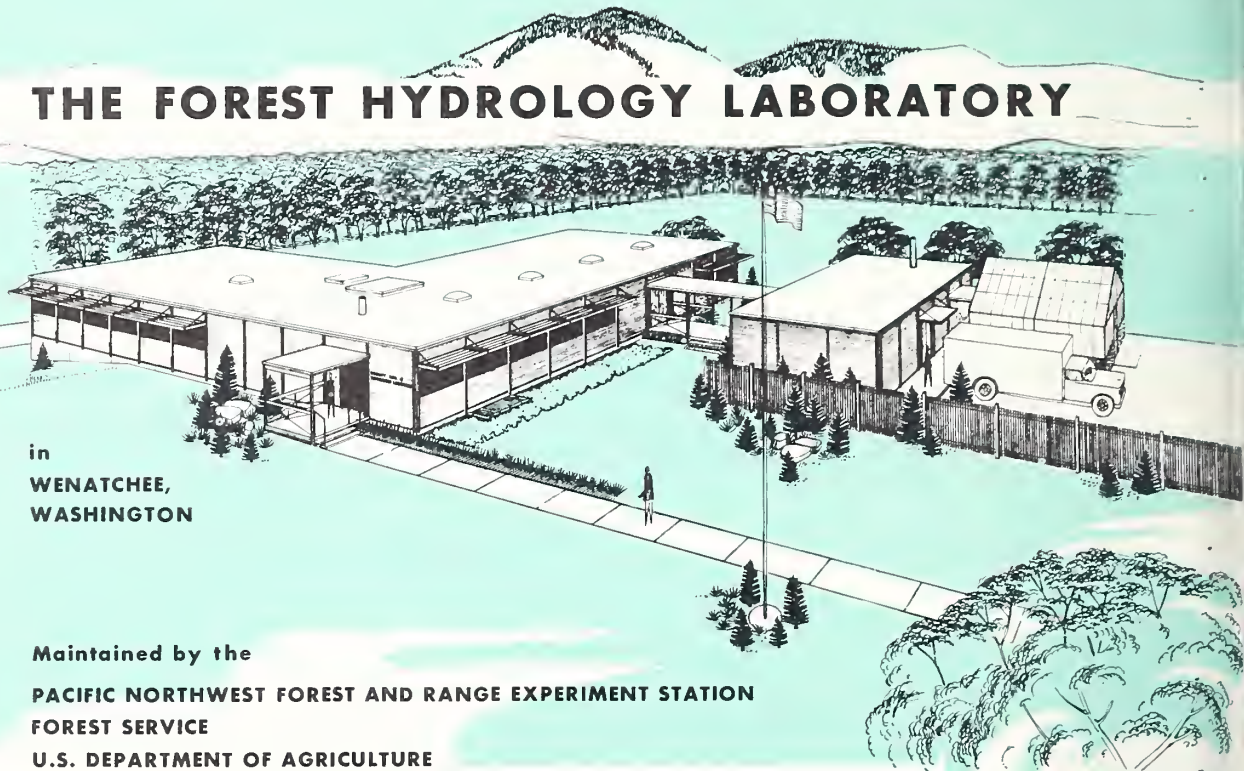
**PACIFIC NORTHWEST
FOREST AND RANGE EXPERIMENT STATION**

**U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE**

THE FOREST HYDROLOGY LABORATORY

in
WENATCHEE,
WASHINGTON

Maintained by the
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE



62524

Designed for research in Watershed Management

A modern facility for basic investigations of soil and water.

A base for field studies of streamflow and erosion in forest and rangelands.

OBJECTIVES

- Increase water yield without floods
- Prevent erosion on forest and rangelands
- Restore stability to eroded watersheds

Results will be directly applicable to watersheds of the eastern Cascade Range, Okanogan Highlands, Blue, Wallowa, and Ochoco Mountains, and all other forests and ranges tributary to the mid-Columbia River in eastern Oregon and Washington.

The water cycle - target of watershed studies



Most of the water we use is influenced by the atmosphere, the soil mantle, and vegetation growing in the soil. All play a part in the **PERPETUAL CYCLE** that keeps us supplied with usable water.

Some phases of the water cycle can be **INFLUENCED BY MAN**. Use of water by vegetation can be regulated by cutting, grazing, burning, or planting. Soil can be made less receptive to water by road-building, logging, burning, and grazing.



Conversely, degraded soils can be built up to provide a better medium for storing and regulating water movement.

OUR JOB in watershed research is first to learn how all elements of the water cycle operate. Secondly, we need to determine the extent to which we can modify these elements. Third, we must determine ways to apply this knowledge, where needed, to increase water available for streamflow, reduce floods, and curtail erosion.



ATMOSPHERE



Insolation from the sun supplies the principal energy required to evaporate water and to stimulate transpiration of moisture by vegetation. Study of these energy transformations involves

- measurement of solar input, temperature, humidity, wind movement, and net radiation in forest and range environments;
- evaluation of changes made by growth or removal of tree, brush, and grass cover.

Above is an instrument for measuring solar radiation at a high-elevation station near Lake Chelon. Right, information is taken from charts produced by instruments which continuously monitor environmental variations.





Studies of **TRANSPIRATION** by vegetation require measurement of moisture movement in roots, stems, and leaves of plants and examination of moisture use in relation to characteristics of soil in which plants grow.

Vegetation is one of the five elements required for soil formation. Infiltration and storage of moisture are affected by exchange of nutrients between soil and plants. Plans for the Laboratory include studies of nutrient cycling in forest and range environments.

In the accompanying photographs, pine twigs are being carefully weighed in the field to determine transpiration rates. In the Laboratory, water used by a Douglas-fir in an enclosed chamber is being measured.



THE SOIL MANTLE

The soil mantle supports vegetative cover, receives water from snow and rain, holds some moisture for plant growth, and transmits another portion to streams and lakes. Research objectives are:

- to improve our understanding of water storage and movement in the soil mantle;
- to devise methods of combating erosion;
- to determine soil deficiencies which prevent natural restoration of cover on eroded lands.

Laboratory facilities provide a means of precisely measuring the physical and chemical characteristics of forest and range soil types in eastern Washington and Oregon. Changes in characteristics which have followed timber cutting, logging, roadbuilding, grazing, and burning will be analyzed.





Watershed Studies

Outdoor "laboratories" are an essential part of watershed management research. Some facts can be obtained only from experimental watersheds or plots where atmosphere, soil, and vegetation exert their combined influences.



Illustrations show measurements of precipitation and runoff being made in an experimental watershed. Purpose of the study is to determine how timber cutting affects amounts of water flowing from the watershed.

Watershed studies carried out in natural environments are a necessary step toward applying results developed by basic laboratory research.

Wildlife Habitat Studies

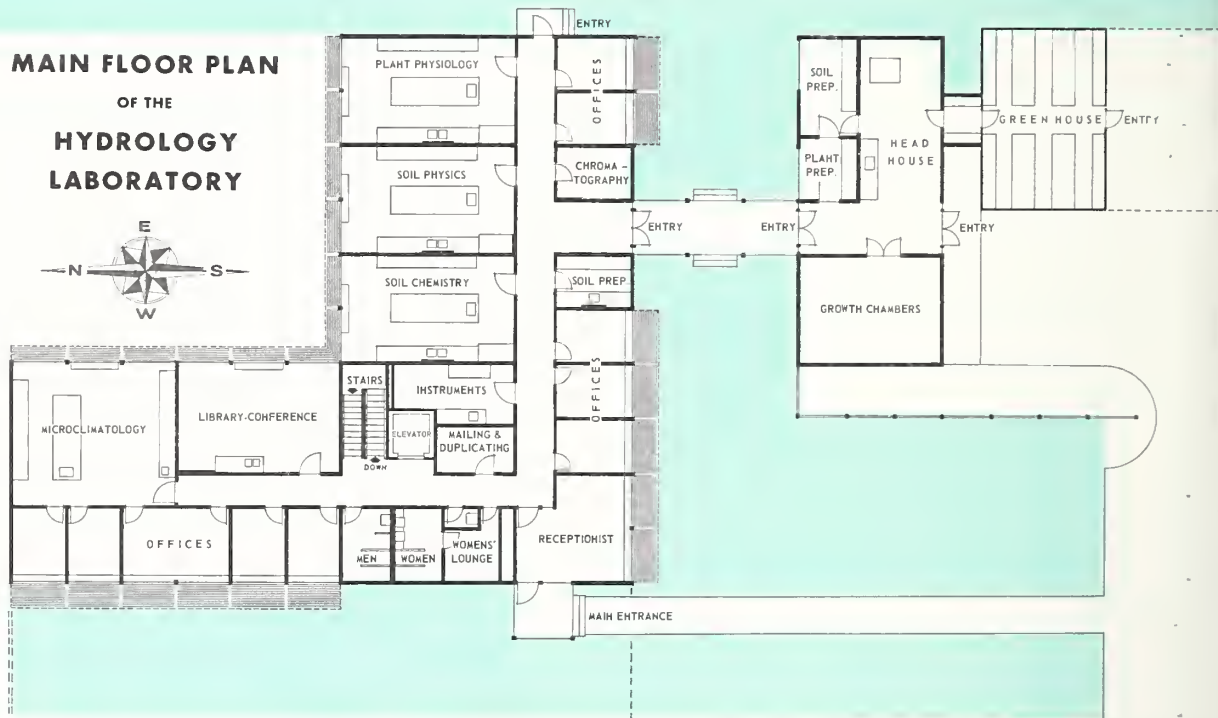
Sustained big game harvests require high value game forage and management of habitat in harmony with livestock range, forestry, and watershed management practices.

Ecological studies provide guidelines to range condition, proper forage use, measures of animal occupancy, and game-range rehabilitation. Especially needed is information on physiological and ecological responses of important browse plants to game grazing.

In the lower illustration, a wildlife scientist is counting the rings on bitterbrush stems to develop an age index to use in the field without destroying the plants. Above, the scientist is measuring the abundance of plants useful for game and for soil cover.



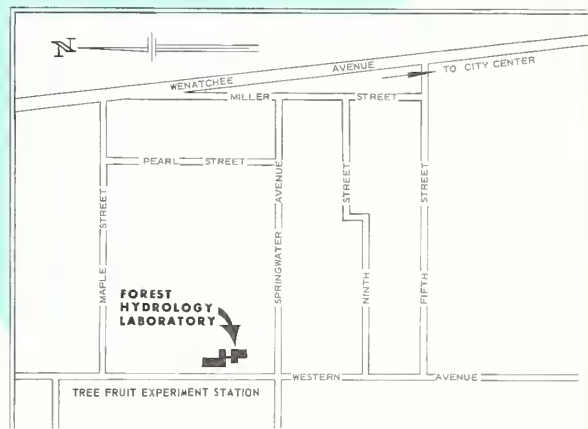
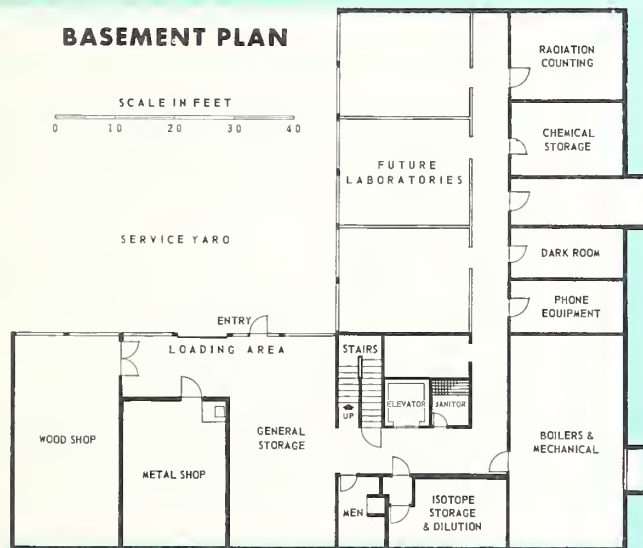
MAIN FLOOR PLAN **OF THE** **HYDROLOGY** **LABORATORY**



BASEMENT PLAN

SCALE IN FEET

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Special Facilities

The Laboratory incorporates several features that contribute toward a more effective job of research.

CONTROLLED ENVIRONMENT STUDIES.

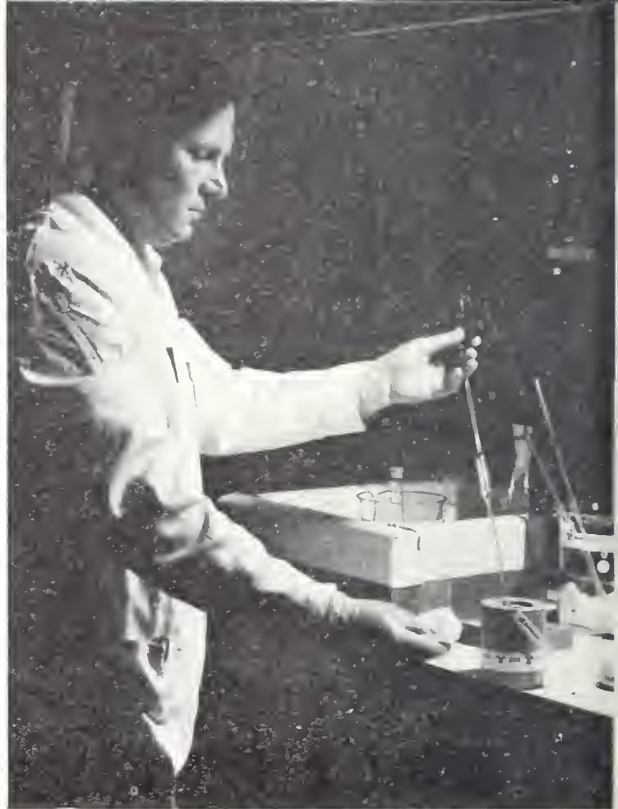
Space is provided for growth chambers used in vegetation studies requiring precise control of temperature, humidity, light, and air circulation.

ISOTOPE STORAGE AND DILUTION.

A special laboratory, shown here, has been designed for safe handling of radioactive materials as they are prepared for experiments. Isotopes can be used, for example, in tracing movement of water through plants or in the soil mantle.

RADIATION COUNTING.

An isolated room is devoted to operation of delicate electronic equipment for detecting radioactivity in treated samples.



Supporting Services

The Forest Hydrology Laboratory, like any other facility of the Federal Government, is owned by the taxpayers and serves the public.

Efficient operation requires not only scientists but also a skilled staff of people whose job includes accounting, procurement, personnel management, building operation and maintenance, clerical services, and visitor information.





**PACIFIC NORTHWEST FOREST AND
RANGE EXPERIMENT STATION**

Head Office: 809 NE 6th Ave.,
Portland, Oregon

DIRECTOR Philip A. Briegleb

FOREST DISEASE RESEARCH
Thomas W. Childs, Chief

FOREST ECONOMICS RESEARCH
Carl A. Newport, Chief

FOREST FIRE RESEARCH
David Bruce, Chief

FOREST INSECT RESEARCH
Robert L. Furniss, Chief

FOREST MANAGEMENT RESEARCH
George S. Meagher, Chief

FOREST UTILIZATION RESEARCH
John B. Grantham, Chief

**RANGE, WILDLIFE HABITAT, AND
RECREATION RESEARCH**
David F. Castella, Chief

WATERSHED MANAGEMENT RESEARCH
E. G. Dunford, Chief

STATION MANAGEMENT
Robert W. Harris, Chief



Philip A. Briegleb
Director, PNW STATION

Booklet prepared by
A. Kathryn Flaherty
Photos by Wallace C. Guy

MANY ARE RESPONSIBLE. The Forest Hydrology Laboratory could not have been built without interest and support of people in the Pacific Northwest and, in particular, many public-spirited citizens of Wenatchee. Funds were provided by Congress in FY 1962 appropriations to the Forest Service through the Department of Agriculture, and a fallout shelter was added by the Department of Defense. Landscaping and a greenhouse were financed by the Accelerated Works Program, ARA, Department of Commerce.

COOPERATORS. Outstanding benefits have resulted from our close association with the Washington State Tree Fruit Experiment Station. This research group, headed by Dr. R. C. Lindner, provides the core of a scientific community which we have gladly joined. Other important cooperators are Chelan County PUD, Wenatchee Chamber of Commerce, Washington State University, and University of Washington.

BUILDERS OF THE LABORATORY

Walker and McGough, A.I.A., Spokane, Washington, architects.

Armstrong and Armstrong, Wenatchee, Washington, general contractors.

Glenn Smith, U.S. Forest Service, Washington, D.C., contracting officer.



